

EXPLANATION OF THE PLATES.

PLATE XXVI.

- | | |
|---|---|
| Fig. 1. <i>Cioniscus gracilis</i> , p. 341. | Fig. 6. <i>Odostomia prælonga</i> , p. 350. |
| 2. — <i>striatus</i> , p. 342. | 7. — <i>crassa</i> , p. 350. |
| 3. <i>Odostomia suboblonga</i> , p. 345. | 8. — <i>unifasciata</i> , p. 351. |
| 4. — <i>tenuis</i> , p. 347. | 9. — <i>sigmoidea</i> , p. 354. |
| 5. — <i>nitens</i> , p. 349. | 10. — <i>flexuosa</i> , p. 355. |

PLATE XXVII.

- | | |
|--|--|
| Fig. 1. <i>Odostomia sinuosa</i> , p. 358. | Fig. 7. <i>Odostomia semicostata</i> , p. 361. |
| 2. — <i>acuticostata</i> , p. 359. | 8. <i>Pyramidella nitidula</i> , p. 363. |
| 3. — <i>fulgidula</i> , p. 359. | 9. <i>Mathilda quadricarinata</i> (apex),
p. 364. |
| 4. — <i>attenuata</i> , p. 360. | 10. <i>Gegania pinguis</i> , p. 365. |
| 5. — <i>compressa</i> , p. 360. | |
| 6. — <i>paucistriata</i> , p. 361. | |

PLATE XXVIII.

- | | |
|--|--|
| Fig. 1. <i>Eulima jeffreysiana</i> , p. 366. | Fig. 6. <i>Eulima piriformis</i> , p. 369. |
| 2. — <i>glabra</i> , p. 367. | 7. — <i>abbreviata</i> , p. 370. |
| 3. — <i>stalioidi</i> , p. 368. | 8. — <i>subumbilicata</i> , p. 370. |
| 4. — <i>solida</i> , p. 368. | 9. — <i>minuta</i> , p. 370. |
| 5. — <i>fusco-apicata</i> , p. 369. | 10. — <i>obtusa</i> , p. 370. |

3. Studies in the Holothuroidea.—IV. On the Structural Characters of the Cotton-Spinner (*Holothuria nigra*), and especially of its Cuvierian Organs. By F. JEFFREY BELL, M.A., F.Z.S., Professor of Comparative Anatomy in King's College.

[Received May 15, 1884.]

Scattered through zoological literature there are here and there references to a Holothurian, of which Selenka appears to have had no knowledge, and which Semper places among the "gänzlich zweifelhaften Arten," but which, unless patriotism is a fault in a man of science, ought to be of interest to British naturalists in so far and inasmuch as it is not only the only known British representative of the restricted genus *Holothuria*, but it is, so far as we know at present, the only member of the family of Aspidochirotae, or Holothurians with shield-shaped tentacles and no retractors for the pharynx, that is found in our seas. Discovered shortly after the publication of Forbes's 'British Starfishes'—which, like every other work from that accomplished pen, had a remarkable influence on his contemporaries—it was first mentioned and described to a scientific audience by Mr. C. W. Peach in 1844, who appears (see Report, 1844, p. 65) to have satisfied the members of the British Association that, in introducing to them the "nigger or cotton-spinner," he was speaking of a Holothurian new to the British fauna. A communication on this animal was read by Mr. Peach to the Royal Polytechnic Institution of Cornwall, and is to be found, with an illustrative plate, on pp. 171–174 of the 'Annals and Magazine

of Natural History,' vol. xv. (1845). In a note on Irish Echinodermata, read to the Dublin Natural-History Society, Prof. Kinahan mentions by name "*Cucumaria niger*, Couch,"¹ as having been taken on the west coast of Ireland (Natural History Rev. vol. vi. p. 369); in the succeeding year (*cf. op. cit.* vol. vii. p. 394) Mr. Foot has a brief note on the habits of what he calls "*H. niger*."

Finally, Prof. Moseley has under his care a specimen in the University Museum at Oxford, which bears the name of *Holothuria nigra*, and is said to have come from the Scilly Islands.

The collection of the British Museum contains five specimens which appear to me to be referable to the species figured by Peach but never yet so described as to be, with certainty, recognized by the systematic zoologist.

The specific characters by which it may be distinguished appear to be:—Suckers almost entirely confined to the trivial surface; tentacles twenty; body elongated; integument very soft. Colour (in spirit) more or less completely black; in life the lower surface and "the thorn-like appendage on the back" are stated to be of a light green colour. Body-wall rather thick. Calcareous spicules rare; the only forms observed were perforated with four large holes, somewhat as in *Thyone fusus* (*cf.* Düben and Koren, Vetensk. Akad. Handlingar, 1844, pl. v. fig. 42). The œsophageal annularia of moderate size; radials and interradials subequal, longest along their middle line, which forms a well-marked, rather broad keel. Polian vesicle large. The Cuvierian organs packed into a large compact mass.

Measurements:—

Length	120	110	105
Greatest breadth . .	37	4	40

The following observations may be made on the just enunciated specific characters. Though the creature has been called "Nigger" by the fisherman, and *nigra*, by the naturalist, it does, as Peach tells us, vary in colour, being "all shades, from sienna to rose-colour and delicate pink." The suckers do not, in spirit-specimens, appear to be arranged in definite rows. They are rather thickly scattered over the whole of the trivial surface; at any rate, Peach is in error in considering that this creature is remarkable for the possession of *four* rows of suckers. From Peach's illustration it would appear that the dorsal papillæ, and especially those at the sides of the body, are much more prominent in living than in preserved specimens.

In the description of the pharyngeal ossicles I have adopted the nomenclature proposed by Prof. Moseley, in his description of a remarkable Holothurian pharynx²; here annularia only, and no pharyngealia, are developed. The scarcity of calcareous spicules was to be expected as soon as one knew that "on exposure to air they lose their tenacity and crumble to pieces;" but, on the other hand,

¹ The addition of the name of Couch must be an error; I find no reference to the species in the 'Cornish Fauna.'

² Q. J. M. S. xxiv. (1884) p. 255.

I must again draw attention to the danger to spicules of maceration in weak spirit¹, and express a hope that this communication will lead to the acquisition of some fresh specimens.

If, however, the "Nigger" has but little protection from calcareous plates, he has, as a "Cotton-spinner," a means of offence which causes him (to again quote Peach) to be "held in great detestation, from its throwing out what they (the fishermen) call cotton. . . . It is extremely irritable, and on being touched or disturbed throws out a bunch of white tapered threads about an inch in length and one eighth in thickness; these soon become attenuated, and are drawn into very long threads of great tenacity. . . . I have seen a crab so completely entangled in it as not to be able to move, and a fish only able to get away after a long struggle." This "cotton" is secreted by the Cuvierian organs, which are arranged in a mode as yet undescribed in any Holothurian.

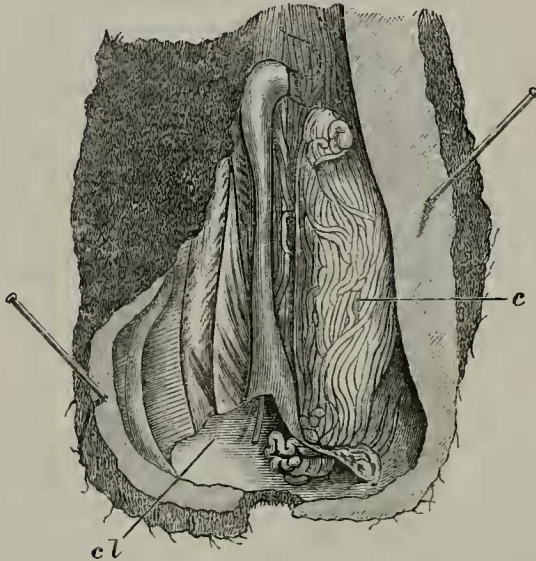


Figure of lower portion of the body of *Holothuria nigra*, opened along the dorsal middle line; the Cuvierian organs (*c*) are seen *in situ*, as is the coil of tubes in the cloaca (*cl*). A bristle has been passed into the rectal opening of the intestine, which has been pushed a little to one side.

When the body is laid open by an incision through the dorsal middle line, the whole centre of the lower part of the cœlom is seen to be occupied by a compact mass, more or less pyriform in shape, quite solid and almost hard to the touch; underlying this is the rectal portion of the intestine, while anteriorly it is hollowed out into a shallow cup, which supports a coil of the intestine (fig. 1). In a specimen 110 mm. long, the mass in question has its greatest length 39 mm.; 9 mm. forming the wall of the cup on the upper surface, where it was a little longer than elsewhere; at its thickest

¹ Journal Roy. Micr. Soc. 1882, p. 481.

the mass measured 15 mm., while the body itself was only 40 mm. at its widest. Traced backwards this mass is found to arise from the cloaca; separated from the investment of connective tissue (which may be in parts pigmented), its free or proximal end is seen to be easily separable into long coiled blind tubes, of which indeed the whole mass is made up. In relation, therefore, and in general structure the tubes are what Johannes Müller called Cuvierian organs¹. They will be found to offer us some interesting characters, both from the morphological and physiological point of view.

In the monograph just cited, the founder of the morphology of the Echinodermata described three types of Cuvierian organs—the cæcal, the racemose, and one to which he gives no distinguishing name, and which may perhaps be distinguished as verticillate. It is to the first group that the organs of *H. nigra* belong; but they differ, so far as I can learn, from any yet described, by the fact that they are closely united together into a firm bundle.

This firm union of the tubes into a single mass makes it difficult for us to imagine how single tubes can be emitted. In the woodcut, however, now given, which has been taken from a specimen in which the organ and its parts occupy their original or natural position, it will be seen that a few coiled tubes are lying in the cloaca (fig. 1, *cl*). Is it not then probable that, on excitement, a suitable contraction separates off this portion of the organ from the rest, and that another expels it to the exterior?

It is not to be thought that so small a portion of the tubes would not be of some size in the water, for 2.5 mm. of one of these tubes may, even after nearly twenty years' preservation in spirit, be stretched out to a length of more than 30 mm.; and this attenuated thread swells up so much in water that, while measuring one division of the micrometer when dry, it occupies seven divisions after treatment with distilled water for ten minutes. We can thus understand that an animal at whom these threads are thrown should, as it attempts to escape, lengthen the threads which, at the same time, coming into contact with the water, would be swollen out transversely as they were extended longitudinally.

The observations made during recent years on these Cuvierian organs seem to justify a more definite statement as to their function than the supposition of Jaeger that they are renal organs, and to lead to an acceptance of the well-grounded statement of Semper that they are not glandular tubes at all, but protective or offensive organs². In this connexion Semper cites Peach's note on the "Cotton-spinner;" and the observations just recorded on the power of increase of length and the influence of water show that he has cited it with justice. The view of Semper, which is shared by Greef, has been recently accepted by M. Jourdan, who, like him, has had the good fortune of being able to work on living and fresh specimens³;

¹ "Ueber den Bau der Echinodermen," Abh. Ak. Berl. 1853.

² 'Holothurien,' p. 140.

³ Annales du Musée d'hist. nat. de Marseille, i. Part 2, no. 6. See also O. Hamann, Zeitschr. f. wiss. Zool. vol. xxxix.

I, I fear, can speak most authoritatively of the accuracy of Semper's statement: "An Spirituspräparaten ist so gut wie Nichts von ihrem feineren Bau zu erkennen"¹.

Finally, as to the systematic value of the Cuvierian organs we must, I think, agree with Semper that they are "viel weniger characteristisch in ihren Formen für die einzelnen Gattungen, als es nach Müller's Arbeiten scheinen könnte." At any rate, in no other organ does *H. nigra* display any character or combination of characters which would lead us to separate it off from the rest of the true *Holothuriæ*.

The five specimens in the British Museum were obtained off the coast of Cornwall; two are said to have been "taken about some crab-pots, at a depth of 20 fms. Polperro."

4. On Races and Hybrids among the Salmonidæ.—Part II. By FRANCIS DAY, F.Z.S.

[Received May 19, 1884.]

On January 15th of this year (see P. Z. S. 1884, p. 17) I gave an account of the continuation of some experiments made by Sir J. Gibson-Maitland, F.Z.S., on the breeding and hybridization of Salmonidæ at Howietoun, and the inception of a few new ones. I propose in this paper to briefly remark upon their continuation, and how matters stood on March 13th, 1884.

First, as to the hybrids between Salmon and Lochleven Trout. The oldest batch of these hybrids are the descendants from 20,000 eggs of the Trout milted from *Salmo salar* December 24, 1881, and which up to March 13, 1884, had been kept in a planked pond, 20 feet long by 5 feet wide. On this date those which remained (numbering 212), all of which appeared to be in perfect health, were removed to the octagon pond at Craigend. Among them, six were over 10 inches in length, but the majority were smaller, and some not above 2½ inches, showing the great range of variation in size of young Salmonidæ raised from eggs and milt obtained at one time from the same parents although the resulting offspring are kept under exactly similar conditions of existence.

I remarked in the paper referred to, that on Nov. 29, 1883, 4500 eggs of the Lochleven Trout (of the season of 1875) were milted from the parr of a Salmon raised at Howietoun², and the eggs were placed in hatching-box No. 88. The number of eggs removed as dead during the following months were as follows:—in December

¹ I have carefully compared M. Jourdan's account of the Cuvierian organs with the interesting account given by my friend Mr. J. E. Blomfield (Q. J. M. S. xxii. p. 355) of the thread-cells of *Myxine*, but I cannot detect any points of similarity. Perhaps M. Jourdan will, in the further investigations which he has promised to make, direct especial attention to Mr. Blomfield's account of *Myxine*.

² An error appears in my former paper, at page 19, these fish having been hatched in March 1881, not 1882.